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Possible Mineral Resources University Land Grant, Montana State University Lands

Eugene S. Perry

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STATE OF MONTANA
BUREAU OF MINES AND GEOLOGY
A. E. Adami, Acting Director

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BUTTE, MONTANA
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COUNTIES CONTAINING MONTANA STATE UNIVERSITY LANDS

INTRODUCTION

The following evaluation of the mineral resources of the University Land Grant lands has been made from an office study of geologic maps and published reports, and from a rather thorough knowledge of the geology of the state by the writer after 25 years of experience in the state. Practically all the mineral resources of Montana, and the districts in which they occur, are described in reports issued by the United States Geological Survey, the Montana Bureau of Mines and Geology, and other agencies. It is improbable that any mineral resource of considerable importance has been overlooked on the lands in question.

It appears that most of the land-grant lands were chosen mainly for their agricultural or grazing possibilities. Nearly all of the lands in the mountain area lie in or near the large intermontane valleys, partially filled with alluvium and/or the deposits formed in extensive extinct fresh-water lakes which once occupied these valleys. Commonly these deposits are 1,000 feet or more in thickness. Where present, they obscure bedrock. No mineral resource of any considerable economic importance has yet been made known in the lake deposits, although locally deposits of sand and gravel, volcanic ash (pumicite), diatomite, and lignite coal are known to be present. Alluvial deposits in certain streams draining mineralized areas yield placer gold, but there is a definite relationship between the location of such streams and the mineralized areas from which the gold originates.

Coal occurs in certain definite formations. Hence, if these formations are not present, coal is not to be expected. In all cases the geologic formation immediately underlying the various lands is known.

Prediction of occurrence of oil and gas is always accompanied by an element of uncertainty. Foremost in such predictions is the consideration of the presence of certain types of geologic structures, such as anticlines and domes; and most test wells are sunk on geologic structures considered favorable. However, deeply hidden traps of oil or gas, known as stratigraphic traps, make possible the occurrence of oil or gas in localities where favorable structural conditions do not show at the surface. Therefore, in central and eastern Montana any lands directly underlain by Cretaceous or younger strata must be considered as possible oil and gas lands, because geologic formations known to yield oil or gas elsewhere should underlie such lands at depth.

This report consists of (1) a Record Book in which lands listed for each of the land-grant schools are tabulated by township, range, section, and fraction of section, together with township plat showing each tract, and information in its present status (1949). In most cases the type of land is indicated. This information was compiled from the records of the Department of State Lands and Investments at Helena by Mr. Perry Roys. (2) A condensed tabulation of the various lands by counties, with brief descriptions of location, geology, and possible mineral resources. (3) A general description of possible mineral resources, by counties, of lands for the school. These descriptions were prepared by the writer.

It is to be understood that if additional information pertaining to geology or mineral resources of any particular tract is desired, much more information is available, and will be available upon request.

PART 1.--TABULATION OF MONTANA STATE UNIVERSITY LANDS

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
BROADWATER COUNTY				
4 N., 1 E.	12 Part sold, 1910	5	In lake deposits and alluvium in creek valley 6 mi. SW. of Toston in Townsend Valley.	Nearest mining district is Radersburg 7 mi. NW. in lavas. No known mineral resources and possibilities unfavorable.
CASCADE COUNTY				
20 N., 3 E.	6, 9, 10, 15 and 23 Part sold 1910-1920	28	In alluvium along Missouri and Sun Rivers near Great Falls.	No known mineral resources and possibilities unfavorable.
CUSTER COUNTY				
6 N., 48 E.	32 Unsold	13	In lower Fort Union strata 12 mi. S. of Miles City at mouth of Pumpkin Creek in Tongue River valley. See USGS Bull. 341-a	No metalliferous mineralization. Possible oil and gas territory, but no known favorable structure Lignite; underlain by Kircher bed (bed A) 3 to 6 ft. thick including partings and coal; variable in thickness and amount of partings.
5 N., 47 E.	12 Part sold, 1919	6	In lower Fort Union strata 14 mi. S. of Miles City in Tongue River valley.	(Ditto above)
FERGUS COUNTY				
12 N.,15 E.	12 Unsold	22	In alluvium and middle Colorado shale. On Ross Fork along railroad 2 mi. E. of Buffalo.	No known metallic mineral resources or coal, possibilities unfavorable. Possible oil and gas territory, but no known favorable structure. Center of Judith Basin syncline. Not attractive for oil or gas prospecting.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
FERGUS COUNTY, Cont'd				
13 N.,15 E.	26 All sold 1910	23	In alluvium and middle Colorado shale on Ross Fork near and N. of Straw.	No known metallic mineral resources or coal, possibilities unfavorable. Possible oil and gas territory, but no known favorable structure. Center of Judith Basin syncline. Not attractive for oil or gas prospecting.
15 N.,23 E.	14, 15, 20 21, and 28 All sold 1902-1910	25	In alluvium and lower Colorado shale along McDonald Creek near Grass Range.	No known metallic mineral resources or coal and none probable. Possible oil and gas territory but no known favorable structure, hence not very attractive for oil or gas prospecting.
16 N.,23 E.	24, 26, 27 and 28 Unsold	27	In alluvium and middle Colorado shale, on Fords Creek 6 mi. N. of Grass Range.	(Ditto above) Possible bentonite deposit in this region, but of inferior grade and thickness.
FLATHEAD COUNTY				
27 N.,20 W.	5, 8, 17, and 18 All sold prior to 1904	42	In alluvium underlain by lake deposits. Bottom lands N. of Flathead Lake.	No known mineral resource and conditions for them are not known to exist.
28 N.,20 W.	3, 4, 5, 6 7, 8, 9,17 18, 19, 20 All sold 1900 - 1915	43	In alluvium underlain by lake deposits. Valley land E. of Kalispell.	No known mineral resource and conditions for them are not known to exist, except possibly sand and gravel.
28 N.,27 W.	14 and 26 All sold 1901 - 1907	44	Mainly in alluvium, but some in strata of Belt series, 30 mi. W. of Kalispell in Pleasant Valley.	No mineral resources in alluvium. Metallic mineralization in Belt strata 15 to 30 mi. W., but none known in this general locality.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
GALLATIN COUNTY				
1 N., 3 E.	6 and 28 Part sold 1910	1	In lake deposits 3 mi. W. and S. of Manhattan.	No known metallic or non-metallic mineral resources except possibly sand and gravel.
1 N., 5 E.	14 All sold 1902-1912	2	In lake deposits 6 mi. NE. of Belgrade.	(Ditto above)
2 N., 4 E.	30 (Unsold)	4	In alluvium and Belt strata along Gallatin River 4 mi. NE. of Manhattan.	No known metallic or non-metallic mineral resource, and none probable.
1 S., 2 E.	4 and 8 Sec. 4 Sold 1912	48	In alluvium and lake deposits along Madison River 8 mi. S. of Logan.	(Ditto above)
1 S., 4 E.	8 Part sold 1907	49	In alluvium and lake deposits along Gallatin River 7 mi. S. of Manhattan.	(Ditto above)
GOLDEN VALLEY COUNTY				
6 N., 19 E.	2 Unsold	7	In Claggett and Judith River formations, 2 mi. W. of Ryegate along Musselshell River.	No metallic mineralization known and conditions unfavorable. No known commercial coal. Possible oil and gas territory, but in syncline between Shawmut and Broadview anticlines. Four dry holes on structure 6 mi. NW. and not attractive for oil and gas prospecting from view point of geologic structure alone.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
GOLDEN VALLEY COUNTY Cont'd				
7 N., 20 E.	18 and 20 Part sold 1908-1910 28 Unsold	16	Bearpaw shale and Judith River formation along Careless Cr. 2 to 4 mi. N. of Ryegate.	No metallic mineralization known and conditions unfavorable. No known commercial coal. Possible oil and gas territory, but in syncline between Shawmut, Broadview, and Womans Pocket anticlines. Several dry holes on the nearby anticlines. Not particularly attractive for oil or gas prospecting from view point of geologic structure.
8 N., 19 E.	28, 30, 32, 34, Unsold	20	Sec. 28 in Judith River formation; others in Claggett shale formation along Careless and Swimming Woman Creeks 10 mi. NW. of Ryegate.	No known metallic mineralization and conditions unfavorable. No known commercial coal. Possible oil and gas territory. Sec. 32 and 34 lie one mile north of crest of Shawmut anticline and sec. 28 and 30 two miles north, but both high up on anticline. Two test wells to Kootenai and one well to Cambrian strata all dry, 1 to 3 miles south on crest of anticline. These lands may be considered moderately favorable for oil and gas prospecting.
GRANITE COUNTY				
9 N., 12 W.	6 All sold 1912	31	In lake deposits overlying Cretaceous strata on Barnes creek 2 mi. SE. of Hall.	No known mineral resources and none likely.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
JEFFERSON COUNTY				
1 N., 1 W.	28 Unsold	29	In lake deposits 3 mi. W. of Willow Creek Station.	No known mineral resources and none likely.
9 N., 2 W.	2 and 5, All sold 1910-1913 Part in Lewis and Clark Co.	30	In lake deposits and S. part of sec. 2 in lava. 2 to 4 mi. SE. of East Helena.	(Ditto above)
JUDITH BASIN COUNTY				
13 N.,15 E.	12 All sold 1912 14 All sold 1907	23	In alluvium and middle Colorado shale, on Ross Fork near Straw.	No known metallic mineral resource or coal, and conditions unfavorable. Possible oil and gas territory, but no known favorable structure. Lands lie in center of Judith Basin syncline, hence not particularly attractive for oil or gas prospecting.
14 N.,15 E.	22 and 26, Unsold 35 all Sold 1912	24	Alluvium and upper Colorado shale on Ross Fork 4 mi. W. of Moore.	(Ditto above)
LAKE COUNTY				
22 N.,19 W.	5 Unsold	36	In alluvium and lake deposits on south shore of Flathead Lake 6 mi. E. of Polson.	No known mineral resource and none probable.
23 N.,20 W.	11 Unsold	37	In strata of Belt series. Island in lake.	(Ditto above)
24 N.,19 W.	4 Unsold	38	In strata of Belt series on east shore of lake (Biol. sta.).	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
LAKE COUNTY Cont'd				
24 N.,21 W.	13 Exchanged	39	In strata of Belt series on north shore of Wildhorse Island.	No known mineral resource and none probable.
25 N.,19 W.	32 Unsold	40	In strata of Belt series on E. shore of lake. (Biol. Sta.)	(Ditto above)
25 N.,20 W.	20 and 22, Part sold 1903 - 1906	41	In alluvium and Belt strata. Near Rollins close to lake.	(Ditto above)
LEWIS AND CLARK COUNTY				
9 N., 2 W.	2 and 5, All sold 1910-1913 Part in Jefferson County	30	In lake deposits 2 to 4 mi. SE. of Helena.	No known mineral resource and none probable.
10 N., 2 W.	11, 14, 15 All sold 1910 - 1913	32	In lake deposits 4 mi. NE. of East Helena.	(Ditto above)
MADISON COUNTY				
5 S., 1 W.	24 All sold 1912	45	In alluvium and lake deposits along Madison River and Jackass Cr. bottoms. 3 mi. NE. of Ennis.	No known mineral resource, and none probable except sand and gravel.
6 S., 1 W.	32 Unsold	46	In alluvium and lake deposits along Madison River bottoms 6 mi. S. of Ennis.	(Ditto above)
7 S., 1 W.	8 All sold 1949	47	In alluvium and lake deposits along Madison River bottoms 7 mi. S. of Ennis.	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
MISSOULA COUNTY				
11 N.,20 W.	12 and 24, Unsold	34	In alluvium and lake deposits along Bitterroot River 10 to 12 mi. S. of Missoula.	No known mineral resource and none probable.
13 N.,19 W.	26 Unsold	35	In strata of the Belt series adjacent to Missoula on SE. side. (Observatory site)	(Ditto above)
PARK COUNTY				
4 S., 9 E.	32 Unsold	50	In alluvium and lake deposits along Yellowstone River bottoms 14 mi. S. of Livingston (near Pray).	No known mineral resource and none probable except sand and gravel.
5 S., 8 E.	22 Part sold 1903	51	In alluvium and lake deposits along Yellowstone River bottoms 19 mi. S. of Livingston (near Emigrant).	(Ditto above)
PETROLEUM COUNTY				
15 N.,25 E.	26, 27, 28, 29, 30, 34, and 35, Part sold 1910	26	In middle Colorado shale formation at and east of Teigen 8 to 12 mi. W. of Winnett.	No metaliferous mineralization or coal known or to be expected. Possible bentonite deposit. Prospective oil and gas territory on McDonald Creek anticline, but in region of local igneous intrusions. Test wells nearby abandoned.
POWELL COUNTY				
11 N., 9 W.	2 Part sold 1903	33	In alluvium and lake deposits on Nevada Creek 5 mi. S. of Finn.	No known mineral resources. Placer gold deposits in this area but none reported on sec. 2.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
ROSEBUD COUNTY				
6 N., 38 E.	2 Unsold	8	In alluvium, Judith River formation and Bearpaw shale formation. 12 mi. W. of Forsyth.	No known mineral resource. Possible oil and gas territory but not particularly attractive for oil or gas prospecting.
6 N., 39 E.	2 Sold 1908	9	In alluvium underlain by Bearpaw shale in Yellowstone River Valley 6 mi. W of Forsyth.	(Ditto above)
6 N., 40 E.	28 Unsold	10	In alluvium underlain by Lower Lance form. 2 mi. SW. of Forsyth in Yellowstone Valley.	(Ditto above)
6 N., 41 E.	12 Unsold	11	In alluvium underlain by middle Lance 7 mi. E. of Forsyth in Yellowstone Valley.	(Ditto above)
6 N., 43 E.	2 Unsold	12	In alluvium underlain by upper Lance 17 mi. E. of Forsyth in Yellowstone Valley.	(Ditto above)
TREASURE COUNTY				
7 N., 36 E.	26 Unsold	17	In alluvium and Bearpaw shale 4 mi. NE. of Hysham at edge of Yellowstone Valley.	No known mineral resource. Possible oil and gas territory, but not particularly favorable for oil or gas prospecting.
7 N., 37 E.	28 All sold 1906-1911 30 Part sold 1911	18	In alluvium and Bearpaw shale 6 and 7 mi. NE. of Hysham at edge of Yellowstone Valley.	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
WHEATLAND COUNTY				
7 N., 15 E.	34 Unsold	14	In alluvium and Colorado shale 8 mi. S. of Harlowton on American Fork.	No known metallic mineral resource or coal and none expected. Possible oil and gas territory. 1500 feet structurally down on west flank of West Dome of Shawmut anticline.
7 N., 17 E.	24 All sold 1906	15	Alluvium underlain by middle Colorado shale along Musselshell River at Shawmut.	No known metallic mineral resource or coal and none expected. Potential oil and gas territory near crest of Shawmut anticline at east side of East Dome 1500 feet down dip from crest.
8 N., 16 E.	34 All sold 1916	19	Alluvium underlain by upper Colorado shale along Musselshell River 6 mi. E. of Harlowton.	No known metallic mineral resource or coal and none expected. Possible oil and gas territory on north flank of Shawmut anticline 2000 feet structurally down from top of anticline.
9 N., 17 E.	8 Unsold	21	Bearpaw shale in uplands 13 mi. NE. of Harlowton.	No known metallic mineral resource or coal and mne to be expected. Possible oil and gas territory in Wheatland synclinal basin, but no known local favorable structure.
YELLOWSTONE COUNTY				
1 N., 26 E.	12 All sold 1905	3	Along Yellowstone River in valley 5 mi. NE. of Billings. Underlain by strata of Claggett and Judith River formations.	No known metallic mineral resource or commercial coal, and none to be expected. Possible oil and gas territory but no known outstanding geologic structure. Land lies on south side of the Lake Basin fault zone.

PART 2

DESCRIPTION OF POSSIBLE MINERAL RESOURCES OF MONTANA STATE UNIVERSITY LANDS.

General Statement

The lands of Montana State University may be grouped, from point of view of possible mineral resources, into (1) those lying in the broad intermontane valleys of western Montana underlain by thick bodies of lake sediments, (2) those in central Montana mainly along river and large creek valleys, and underlain by strata of Upper Cretaceous age which makes them possible oil and gas lands, and (3) two tracts in Custer County lying within the coal-bearing strata.

No tracts of land are in or near metalliferous mining districts. Tracts in western Montana underlain by several hundred feet of lake sediments can not be assigned a metalliferous mineral value because the lake-beds are not mineralized, and it is unsound speculation to try to predict mineralization beneath them. Placer gold is known to occur in some valleys of western Montana, as for example near Helena, Radersburg, Alder, and Finn; but very little of the University lands appear favorably situated for such deposits. (See Powell Co.)

No commercial deposits of coal, oil, or gas are to be expected in or underlying the lake deposits under the State University lands. Locally, deposits of sand and gravel may be present. The lake deposits in certain places in the intermontane valleys are known to contain volcanic ash (pumicite), diatomite, coal, and possibly bentonite; however so far as known to the writer none of the lands listed are underlain by these materials. The lake deposits also contain much clay, but available information indicates that most of these clays are inferior for ceramic products (low fusibility and high shrinkage).

All lands in central Montana underlain by Cretaceous strata must be considered as possible oil and gas lands, because geologic formations which yield oil and gas in known productive oil and gas fields will underlie these lands. However, the mere presence of such a formation by no means indicates that oil or gas will be present in it. The presence of certain types of geologic structure, such as anticlines and domes, greatly enhance the favorableness of lands for oil or gas occurrence; but favorable structure is not the sole factor in oil occurrence, because other geologic conditions known as "stratigraphic traps" may be present, and stratigraphic traps give no evidence at the surface, especially when they may be a mile or more in depth. The State University lands in Custer, Fergus, Golden Valley, Judith Basin, Petroleum, Rosebud, Treasure, Wheatland, and Yellowstone counties fall into this class. Certain lands in Golden Valley and Wheatland counties are somewhat favorably situated with respect to favorable structure, but not ideally situated. None of the University lands are closer than 25 miles to producing oil or gas fields.

None of the State University lands in central Montana lie in commercial coal fields. Thin and/or impure beds of coal in the Judith River formation may underlie some tracts, but the geologic formations present on most of the other lands confute existence of commercial beds of coal. Two tracts of land in Custer County may be underlain by lignite coal, 3 to 6 feet in thickness includ-

ing partings, but it is indeed questionable if such beds will be commercial in Montana for many years (perhaps many decades) to come.

In general it appears that lands held by the State University should be classified as grazing, agricultural, and (in Lake County) recreational lands, and some timber may be present locally. There is a possibility of oil or gas occurrence in central and eastern Montana, perhaps remote except in Wheatland and Golden Valley counties.

Broadwater County

The tract of land listed for Montana State University as in Broadwater County (partly sold) lies along a small creek or coulee about 6 miles southwest of Toston in Townsend Valley. It is underlain by large thickness of alluvium and lake deposits. The nearest mining district is at Radersburg, 7 miles northwestward, underlain by a series of lavas.

There is no known mineral resource in the lake deposits in this locality, and possibilities are unfavorable. This land would appear to be too far from mineralized areas to contain placer gold deposits.

Commercial deposits of coal, oil, or gas are not to be expected in the lake deposits in this locality, and it is probable that barren pre-Cambrian strata of the Belt series underlie the lake beds at depths of possibly 1000 feet or more.

Cascade County

The 5 tracts of land listed for Montana State University in Cascade County (part sold 1910-1920) lie along Missouri and Sun River Valleys 1 to 3 miles south and west of Great Falls. They are underlain almost entirely by alluvium although some land may lie on adjacent bedrock. Strata of the Lower Cretaceous Kootenai formation underlie the alluvium. There are no known mineral resources on these lands, and possibilities are unfavorable, except that Kootenai shale may be used in brick making. The Madison limestone which yields oil near Shelby underlies these lands at a depth approximately 600 feet, but these lands have not been considered attractive for oil or gas prospecting by major oil companies. A test hole nearby was drilled into the limestone formation.

Custer County

Two tracts of land listed for Montana State University in Custer County (partly sold 1919) lie in Tongue River valley 12 and 14 miles south of Miles City at and near the mouth of Pumpkin Creek. Strata exposed are a part of the Lebo shale member (lower member) of the Fort Union formation which is the main coal-bearing formation of eastern Montana.

No metallic mineralization is known, and conditions for its occurrence are adverse.

This region, lying centrally at the north end of the Powder River structural basin, is possible oil and gas territory. However, no local geologic structure such as is considered favorable for oil or gas accumulation is known to be present on or near the lands in question. In general, so far as known to the writer, oil and gas leasing has not been active in this locality, which indicates the attitude of oil and gas companies toward this area.

U. S. Geological Survey Bulletin 341-a (pp. 37-61) shows that a bed of lignite coal (Kircher or A bed) 3 to 6 feet thick crops out close to Tongue River from Miles City to the mouth of Pumpkin Creek, and then continues southward beneath river level. Another thin and irregular bed (3 to 3½ feet thick) (Bed B) is reported to occur 60 feet higher in the series of strata. These coals should underlie the lands in question, however information on thickness and depth is not available. The lower or A bed was once worked about 6 miles north of the mouth of Pumpkin Creek (Weaver mine) where a thickness of 4.3 feet is reported. The A bed is described as "exceedingly variable, and workable only in small areas." (Bull. 341, p. 47). Water wells drilled to a depth of 500 feet at Miles City failed to reveal any important coal beds beneath Bed A. In view of the relative thinness, irregularity, and partings in Bed A, its occurrence under the lands in question below river level, and the existence of other beds 10 to 20 feet or more in thickness in this part of Montana, the writer does not attach much commercial significance to the occurrence of coal under the lands in question.

Fergus County

The State University lands near the boundary of Fergus and Judith Basin counties listed in T. 12 and 13 N., R. 15 E. (partly sold, 1912-1917) lie along Ross Fork near Buffalo and Straw in a prosperous agricultural area. Bedrock is lower and middle Colorado shale. No metallic mineral resources or coal have been discovered, and conditions favorable for their occurrence are not present. This region may be considered as possible oil and gas territory, but the lands in question lie in the center of the Judith Basin syncline, and no minor favorable structure is known. Hence these lands would not be considered attractive for oil or gas prospecting from a structural point of view.

The lands listed in T. 15 N., R. 23 E. (all sold, 1902-1910) lie along McDonald Creek near Grass Range. Beneath creek alluvium are strata of the lower part of the Colorado shale formation. No metallic mineral resource or coal are to be expected. A bentonite bed lies in nearby hill-land but not on these lands. This region may be considered as possible oil and gas territory, but no known favorable structure is present. Several "dry" holes have been drilled 8 to 10 miles eastward. In general these lands are not to be considered particularly attractive for oil or gas prospecting because of lack of favorable structure.

The lands listed in T. 16 N., R. 23 E. (not sold) lie along Fords Creek about 6 miles north of Grass Range. Bedrock is middle or lower Colorado shale. No metallic mineral resource or coal is present. Oil and gas possibilities are similar to those described immediately above.

Flathead County

All State University lands listed in Flathead County were sold prior to 1909 except 160 acres which were sold in 1915. Lands in Tps. 27 & 28 N., R. 20 W. in Flathead Valley south and east of Kalispell (all sold, 1900-1915) are underlain first by alluvium, then by lake deposits, and then probably by strata of the Belt series. There are no known mineral resources in the lake-beds, and none are to be expected with the possible exception of sand and gravel.

Lands in T. 28 N., R. 27 W. in Pleasant Valley 30 miles west of Kalispell (sold, 1901-1907) are underlain in part by alluvium, and in part by strata of the Belt series. Although metallic mineralization occurs in Belt strata in Sanders and Lincoln counties 20 to 30 miles southward and westward, no commercial mineralization is known at or near Pleasant Valley, and apparently this area lies outside of the Sanders-Lincoln county mineralized region.

Commercial deposits of coal, oil, or gas are not to be expected beneath the lands in question.

Gallatin County

All State University lands listed in Gallatin County (partly sold, 1902-1912) lie in Gallatin Valley in alluvium and lake deposits, except one small tract in Belt strata.

No metallic or nonmetallic mineral resources except possibly sand and gravel are known, and conditions are unfavorable for their occurrence.

Golden Valley County

The lands listed in Golden Valley County for Montana State University (mostly unsold) lie in the outcrop areas of the Judith River and Claggett formations (upper Cretaceous age) which are composed of sandstone and shale. Locally thin beds of coal may be present in Judith River strata, but none are known to be commercial in this county. The sandstone could be used for building stone, but it is relatively soft, and its durability and desirability are not known. The shale is not known to be of the type desirable for brick-making. No metalliferous mineralization is known in this part of Montana, and because of geologic conditions none is to be expected.

All the lands lie in possible oil and gas territory. Sec. 2, T. 6 N., R. 19 E. and secs. 18, 20 and 28, T. 7 N., R. 20 E. lie in a synclinal area between the Shawmut, Big Coulee-Hailstone, and Woman's Pocket anticlines, and hence from a structural view point alone are not particularly good prospective lands for oil or gas. However, other factors such as stratigraphic traps may affect their attractiveness. Sections 32 and 34, T. 8 N., R. 19 E. lie about one mile north of the crest of the Shawmut anticline at its eastern end, and sections 28 and 30 lie about two miles north of the crest; hence from a structural view point these 4 sections may be considered moderately favorable.

Six wells have been drilled along the crest of the Shawmut anticline without success. Eight wells have been drilled on the Big Coulee-Hailstone dome. Also several wells have been drilled on the Woman's Pocket anticline. Early wells drilled into the Kootenai formation reported shows of oil but were abandoned. A well drilled in 1948 on the Woman's Pocket anticline reported excellent showings of oil in the Amsden limestone at a depth of 2105 feet, but as of July, 1950, no production of oil was recorded. Other wells have been drilled into the limestone series on this structure without notable results. The well yielding shows of oil from the Amsden is about 3 miles east and 3 miles north of the lands in T. 8 N., R. 19 E. and T. 7 N., R. 20 E. Structurally, the well is in a saddle between the Shawmut and Woman's Pocket anticlines, and this condition may enhance the potential value of University lands mentioned. Occurrence of oil in the limestone series may result more from porosity conditions than from structural conditions. At any rate this part of Montana was being actively leased for oil and gas by many of the major oil and gas companies during 1949 and 1950.

Granite County

A section of State University land in Granite County (sold 1912) lies in the valley lands of Barnes Creek about 2 miles southeast of Hall. It is underlain by lake deposits which in turn are probably underlain by intensely deformed Cretaceous strata. Small amounts of placer gold in gravel overlying the lake-beds have been reported in this general locality, but so far as known this particular section has no mineral resource, and it is probable that none is present.

Jefferson County

One-half section of State University land (not sold) lying in Jefferson River valley about 3 miles west of the town of Willow Creek is underlain by a large but an unknown thickness of lake deposits. No mineral resource is known, and it is unlikely that any is present.

One and one-half sections (sold 1910-1913) about 2 to 4 miles southeast of East Helena are underlain mainly by lake-beds. A small part of one section is in a lava area. No mineral resource is known on these lands, and it is probable that none is present.

Judith Basin County

State University lands in six sections (partly sold) lie on and near Ross Fork north of Straw and about 4 miles west of Moore. All are underlain by creek alluvium and by shales in the middle and upper part of the Colorado formation of Upper Cretaceous age. No metallic mineralization is known, and none is to be expected because of geologic conditions. No coal is to be expected. Colorado shale in itself is valueless.

This part of Montana may be considered prospective oil and gas territory. However, these lands lie in the trough of the Judith Basin syncline, and no geologic structure favorable for oil or gas accumulation is known to be present.

Eight test wells have been sunk within a radius of 20 miles of these lands without success. Hence these lands probably would not be considered particularly attractive for oil or gas prospecting at the present time.

Lake County

The six tracts of State University land listed in Lake County (partly sold) lie on or close to the shore of Flathead Lake or on islands in the lake. All these lands are underlain by alluvium or strata of the Belt series, and all are distant from mining districts. No mineral resources are known on these lands, and it is probable that none is present. Geologic conditions are entirely adverse for the presence of coal, oil, or gas.

Lewis & Clark County

The State University lands listed in Lewis & Clark County lie 2 to 4 miles southeast, and 4 miles northeast of East Helena in the area of lake-beds. No mineral resources are known, and none is probable in the lake deposits. Thickness of the lake deposits, and kind of underlying rock is not known; but it is probable that the lake deposits are several hundred feet thick, and that they are underlain mainly by strata of the Belt series, but possibly in part by a lava series. These rocks are not known to be mineralized in this locality. Possibly some of the clays of this locality could be used for brick manufacturing or other ceramic purposes but they have not been studied.

Madison County

The three tracts of State University land in Madison County (partly sold since 1909) lie along Madison River bottoms 3 to 7 miles north and south of Ennis. The northern tract lies along Jackass Creek near its mouth. All the lands are underlain first by alluvium and then by lake deposits which are probably 1000 feet or more in thickness. No mineral resource (other than sand and gravel) is known in the alluvium or lake deposits, and it is not probable that any is present. Placer gold has been found along certain tributary streams near Ennis, but none is known to occur along Madison River itself near Ennis.

Missoula County

Two sections of State University land (not sold) in Missoula County lie in the river bottoms along Bitterroot River 10 and 12 miles south of Missoula. They are underlain first by alluvium and then by lake deposits, total thickness of which may be 1000 feet or more. No mineral resource is known to be present, and it is improbable that any will be found other than sand and gravel. High-ash lignite coal occurs in the lake deposits of Bitterroot and Missoula valleys but none is known to underlie these lands.

One section of land (not sold) lies adjacent to Missoula southeast of the townsite on Clark Fork and in the mountain area (Mount Sentinal) southward. It is underlain by quartzite and argillite of the Belt series. No mineral resource is known to be present, and it is improbable that any is present, except that sand and gravel may be present along Clark Fork.

Park County

Two tracts of land in Park County (part sold 1903) lie along Yellowstone River bottoms 14 and 19 miles south of Livingston near Pray and Emigrant. The lands are underlain by alluvium and lake deposits, total thickness of which may be 1000 feet or more. No mineral resource is known in this area, and it is improbable that any is present. Placer gold has been mined up Emigrant Creek, but is not known to be present in commercial amount along Yellowstone River between Emigrant and Pray.

Petroleum County

The several sections of State University land listed in Petroleum County (partly sold 1910) form a strip five miles long lying along McDonald Creek just east of Teigen, or 8 to 12 miles west of Winnett. Strata exposed are in the middle part of the Colorado shale formation of upper Cretaceous age. No coal or metallic mineralization are to be expected in this locality. A bed of bentonite, reported to be thin and of inferior quality, may be present on some of these lands.

This is prospective oil and gas territory. Maps issued by the U. S. Geological Survey (U. S. G. S. Bull. 786, pl. 3) show that the axis of the McDonald Creek anticline passes through this strip of sections. This is a very gentle inconspicuous warping of strata. Four test wells (unsuccessful) have been sunk into Lower Cretaceous and Upper Paleozoic strata within one mile on all four sides of the strip, and ten other wells (unsuccessful) have been drilled within a radius of 15 miles of the strip. Four wells 6 to 10 miles southward are reported to have had showings of oil and gas, but they were abandoned. None of the wells continued deep into Paleozoic limestone formations, hence they are not to be considered complete tests, however strata above the limestones were tested along or near crests of the McDonald Creek and Flat Willow anticlines.

This general locality is unusual in that locally bodies of dark-colored igneous rock have been intruded into the Cretaceous strata. It is not known that any of these bodies occur on the lands in question; however these igneous bodies may have had a bearing on oil and gas accumulation, and they appear to have prevented active artesian circulation which is strong in the Kootenai formation in adjacent areas.

The several unsuccessful test wells sunk in this area do indeed detract from its desirability for future testing, but these wells do not completely condemn the area, because the limestone series as a whole has not been tested. These lands may have a lease value, and possibly should be considered as potential oil and gas lands.

Powell County

One-half section of State University land in Powell County (not sold) lies in a valley along Nevada Creek about 5 miles south of Finn, or about 11 miles northwest of Avon. The land is underlain first by alluvium and then by lake deposits, and it is probable that pre-Cambrian quartzite and argillite of the Belt series underlie the lake-beds.

Belt strata are mineralized locally in this part of Montana, but such mineralization can not be predicted beneath the lake deposits. Placer gold has been mined from alluvial gravel in streams tributary to Nevada Creek near section 2, and some is reported in Nevada Creek about 3 miles northwest. Placer gold may occur on section 2, but information is not at hand concerning this point.

No mineral resource is to be expected in the lake deposits in this locality.

Rosebud County

Five tracts of State University land in Rosebud County (mainly unsold) lie in Yellowstone River valley, either adjacent to or near the river 2 to 17 miles east and west of Forsyth. Nearly all the lands are underlain by river alluvium which in turn is underlain by upper Cretaceous strata typical of the Montana plains.

No metallic mineralization is known or to be expected.

Impure coal beds may underlie the easternmost land (T. 6 N., R. 43 E.), but so far as known none is commercial.

This part of Montana is prospective oil and gas territory. Lands in T. 6 N., Rgs. 38, 39, and 40 E. lie far down on the south flank of the huge Porcupine dome, but so far as known no minor geologic structure such as might be favorable for oil or gas accumulation is present on any of these lands. (U. S. G. S. Bull. 621-F.). Three unsuccessful relatively shallow test wells have been sunk in this immediate locality, and seven or more wells have been sunk on top of the Porcupine dome about 25 miles northward, some of which entered Paleozoic limestone. Hot water was found in Lower Cretaceous (Kootenai) strata. In general the area where these lands lie has not been considered particularly attractive for prospecting by the oil and gas industry because of their position so far down on the flank of the domal structure.

Treasure County

Three tracts of State University land in Treasure County (part sold) lie in Yellowstone River valley 5 to 6 miles northeast of Hysham. They are underlain in part by river alluvium, and in part by Bearpaw shale (Upper Cretaceous in age).

No metallic mineralization or coal are known or to be expected.

This is prospective oil and gas territory. The three tracts lie far down on the south flank of the huge Porcupine dome, and the western two tracts lie on what maps show to be a southern extension of the Ingomar anticline, the high point of which is about 14 miles northwestward. (U. S. G. S., Structural Contour Map of the Montana Plains.) A deep well drilled on this structurally high point is reported to have had showings of gas, but the well was abandoned. It is difficult to evaluate the oil and gas possibilities of these lands, however so far as known to the writer leasing during the years 1948 to 1950 (very active years in leasing in central Montana) was inactive in this area.

Wheatland County

Montana State University lands in Wheatland County consist of two tracts (one sold 1916) along Musselshell River 6 and 15 miles east of Harlowton, one tract on American Fork 8 miles south of Harlowton (unsold), and one tract in the benchlands 13 miles northeast of Harlowton (unsold). The first three are underlain by alluvium and Colorado shale, the last is underlain by Bearpaw shale.

No metallic mineral resources or coal are known to be present, and none are to be expected. No other mineral resource is known.

This part of Montana is prospective oil and gas territory. A pronounced anticlinal fold, known as the Shawmut anticline, extends for 30 miles southwesterly through Shawmut. Total closure of the structure is about 2500 feet, and the western end has two high points along the crest known as East and West domes. Six wells have been drilled along the crest, two of which penetrated upper Paleozoic strata. All wells have been abandoned. These wells do indeed detract from the desirability of this area for oil and gas, but they do not completely condemn the area, because of the possibility of stratigraphic traps which give no evidence at the surface.

Section 14, T. 7 N., R. 15 E., 8 miles south of Harlowton, lies on the west flank of West Dome about 1500 feet down-dip from the crest and about 2 miles distant. Section 24, T. 7 N., R. 17 E. lies along the crest of the anticline on the east flank of East Dome about 1500 feet down-dip from the top of the dome and about 3 miles distant. Section 34, T. 8 N., R. 16 E. lies far down on the north limb of the anticline about 2000 feet down-dip from the crest of East Dome and about 3 miles distant. Section 8, T. 9 N., R. 17 E. lies about 15 miles north of the axis of the Shawmut anticline in a structural basin known as the Wheatland syncline.

Evaluation of these lands is difficult because subsurface conditions at the top of the Paleozoic series of strata are but vaguely known, however, all these lands should have a lease value, and should be considered as possible, or perhaps potential, oil and gas lands.

Yellowstone County

One tract of land listed for Montana State University in Yellowstone County (sold 1905) lies in Yellowstone River Valley along the north side of the river 5 miles northeast of Billings. It is underlain by strata of the Claggett and

Judith River formations of upper Cretaceous age.

No metallic mineral resources or coal are known to be present, and conditions are unfavorable for their presence.

This is possible oil and gas territory, however no important geologic structure such as is considered favorable for oil or gas accumulation is known to be present. The so-called Lake Basin fault zone passes immediately north of this tract. Lack of known favorable structural conditions makes this land relatively unattractive as good prospective territory for oil and gas